Real-Time Decision Support of Cardiovascular Parameters in Cardiac Surgery Patients: Part 1: System Architecture and Operation.

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We have previously reported, via the ARS forum, on simulation results for modelling the function of the cardiovascular system in disease and drug responses, decision support and its validation in simulation [1]: we now propose to describe the development of the associated real-time decision support system.

The Decision Support System (DSS) setup includes the LiDCO*plus* hemodynamic monitor and its data interface which allows the real-time transfer of patient data from the monitor to the host computer. The link between the monitor and the host computer was established via a standard Ethernet cable and was based on the universal TCP/IP protocol.

The computer collects real-time beat-to-beat data from the LiDCO monitor and displays it on-screen. 'Target ranges' for the DSS (suitable parameters) are set by the clinician, which are displayed on screen. The DSS also displays real-time data in the 'haemodynamic status' box: coloured 'low', 'normal' and 'high' boxes light depending on whether the data falls within the target range or not. The DSS

Fig 1: Snapshot of the DSS interface on- screen

suggests the drug/fluid, and an infusion rate in the 'therapy status' box; the clinician assesses the suggestion: if he/she agrees, then he/she would click-on the syringe motif to acknowledge, and to manually adjust the syringe pump infusion rate. The infusion rate is displayed in the 'advisor infusion rate' box. This can be over-ridden by the expert inputting the desired infusion rate in the 'expert infusion rate' box should that be at variance with the DSS output. Real-time clinical data obtained from a run on one patient will be presented in Part 2 of this paper.
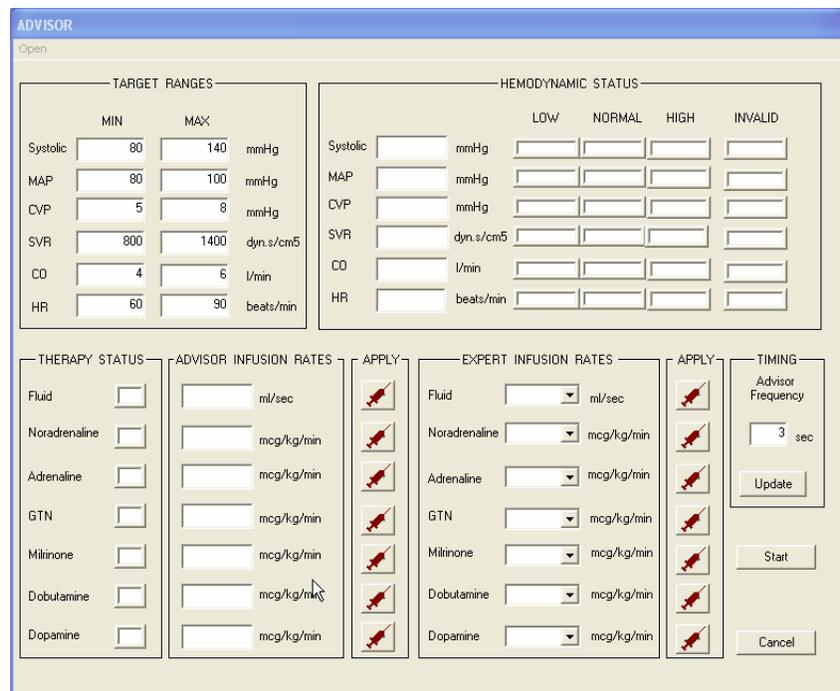
[1] Denaï MA, Mahfouf M, & Ross JJ, A Fuzzy Decision Support System for Therapy Administration in Cardiovascular Intensive Care Patients, *IEEE International Conference on Fuzzy Systems*, July 2007, London, England.